Complex analytic varieties, 7.5 hp

Course period:
November 1st, 2016 – March 18, 2017

Last day for application:
November 1st, 2016

Course leader / Address for applications:
Elizabeth Wulcan / wulcan@chalmers.se

Course description (Advertisement for Ph. D. students):
The aim of the course is to give an introduction to complex analytic varieties, i.e. sets that are locally the zero sets of holomorphic functions. Analytic varieties give rise to a rich and interesting theory and they appear naturally in many areas of mathematics.

We will start by studying local aspects of the theory, including the Weierstrass preparation theorem and the local parametrization theorem. Then we will introduce coherent sheaves, which is a fundamental tool in the study of analytic varieties that allows us to glue local data together. After investigating various global aspects, we will focus on singularities of varieties; we will study normal spaces, which have mild singularities in a certain sense, and discuss blowups and resolution of singularities.

The course will start in the beginning of November 16 and run once a week (2 hours) until mid-March 17 (LP2-3). The schedule will be decided by participants at an introductory meeting.

Responsible department and other participation departments/organisations:
Mathematics Department

Teacher:
Elizabeth Wulcan

Examiner:
Elizabeth Wulcan

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1. Confirmation
The syllabus was confirmed by the Head of the Department of XXX 200X-XX-XX, 200X-XX-XX.

Disciplinary domain: Science
Department in charge: Department of Mathematical Sciences
Main field of study: Mathematics

2. Position in the educational system
Elective course; intended for graduate students or last year master students.

3. Entry requirements
Complex analysis, Commutative algebra.

4. Course content
The course will cover a suitable subset of the following topics:

- Local properties of holomorphic functions, Weierstrass preparation theorem
- Coherent analytic sheaves, Oka's coherence theorem
- Complex spaces, cycles, divisors, meromorphic functions
- Normal spaces, Oka's normalization theorem
- Blowups and resolution of singularities.

The final curriculum will be decided upon during the course.

5. Outcomes
At the end of the course, the students will have acquired knowledge about some of the main basic results about complex analytic varieties and coherent sheaves.

6. Required reading
The following are some suggestions for reading:

- J.P. Demailly: Complex Analytic and Differential Geometry, Chapter II - Coherent Sheaves and Analytic Spaces
- H. Grauert, T. Peternell, R. Remmert: Several Complex Variables VII (Encyclopedia of Mathematical Sciences, volume 74), Chapter I - Local Theory of Complex Spaces

7. Assessment
At the end of the course the participants will be asked to present a topic of there choice, and there will also be an oral exam.

A Ph.D. student who has failed a test twice has the right to change examiners, if it is possible. A written application should be sent to the department.

In cases where a course has been discontinued or major changes have been made a Ph.D. should be guaranteed at least three examination occasions (including the ordinary examination occasion) during a time of at least one year from the last time the course was given.

8. Grading scale
The grading scale comprises Fail, (U), Pass (G)

9. Course Evaluation
The course evaluation is carried out together with the Ph.D. students at the end of the course, and is followed by an individual, anonymous survey. The results and possible changes in the course will be shared with the students who participated in the evaluation and to those who are beginning the course.

10. Language of instruction
The language of instruction is English.